

Unit 9 - Week 7 : Energy Balances on Nonreactive Processes

Course outline

How does an NPTEL online course work?

Week 0 : Prerequisite

Week 1: Introduction

Week 2: Process Variables and Rate

Week 3: Fundamentals of Material Balance

Week 4: Basic Principles of Compressible System

Week 5 : Basic principles of multiphase system

Week 6 : Energy and Its Forms

Week 7 : Energy Balances on Nonreactive Processes

Lecture 7.1: The mechanical energy balance

Lecture 7.2: Enthalpy balances without reaction

Lecture 7.3: Energy balance with multiple streams without reaction

Lecture 7.4: Energy balance on heat of solution

Quiz : Assignment 7

Feedback form

Week 8 : Energy Balances on Reactive Systems

Week 9 : Balances on Transient Process

Week 10 : Computational Techniques

Week 11 : Computer-aided balance calculations

Week 12 : Case Study for a Process

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Assignment 7

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-18, 23:59 IST.

1) The Bernoulli's equation is given by where ρ is the density, ΔP is the pressure, V is the velocity, g is the acceleration due to gravity, and Δz is the elevation height 1 point

- $\rho^{-1} \Delta p + 0.5 V^2 + g \Delta z = 0$
 $\rho^{-1} \Delta p - 0.5 V^2 = 0$
 $\rho^{-1} \Delta p + V^2 = 0$
 $\rho^{-1} \Delta p + 0.5 V = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\rho^{-1} \Delta p + 0.5 V^2 + g \Delta z = 0$

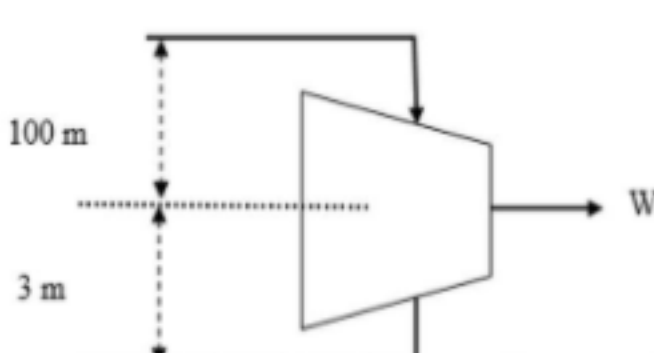
2) Which one of the following is not a mechanical energy 1 point

- potential
 internal energy
 kinetic energy
 both (a) and (b)

No, the answer is incorrect.
Score: 0

Accepted Answers:
internal energy

3) The mass flow rate of water 560 kg/s is passed through a pipe at the height of 100 m above the turbine, where the pressure is 207 kPa. The pressure at 3 m below the turbine is 124 kPa. How much work is generated by the turbine? (Given: $g = 9.8 \text{ m/s}^2$; efficiency of turbine is 100%). 1 point



- 615.6 kW
 203.1 kW
 612.08 kW
 406.34 kW

No, the answer is incorrect.
Score: 0

Accepted Answers:
612.08 kW

4) The process of heating a liquid mixture to form vapor and then cooling to get pure component is called 1 point

- evaporation
 distillation
 drying
 crystallization

No, the answer is incorrect.
Score: 0

Accepted Answers:
distillation

5) The change in the total energy of the system can be expressed as where, ΔE , ΔU , ΔKE , and ΔPE are the change in total energy, internal energy, kinetic energy and the potential energy of the system 1 point

- $\Delta E = \Delta U + \Delta KE + \Delta PE$
 $\Delta U = \Delta KE + \Delta PE$
 $\Delta E = \Delta KE - \Delta PE$
 $\Delta PE = \Delta KE - \Delta U$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\Delta E = \Delta U + \Delta KE + \Delta PE$

6) Which one of the following is applicable for Bernoulli's equation? 1 point

- for ideal incompressible fluid
 for rotational fluid
 for non-ideal fluid
 both rotational and irrotational fluid

No, the answer is incorrect.
Score: 0

Accepted Answers:
for ideal incompressible fluid

7) A cylinder fitted with a movable piston is filled with gas. The amount of 20.920 kJ of heat is transferred to gas to raise the temperature by 150 °C. The gas does 50 J of work in the moving piston to its new equilibrium position. What should be the change in the internal energy of the system? 1 point

- 20.870 kJ
 19.871 kJ
 22.897 kJ
 24.659 kJ

No, the answer is incorrect.
Score: 0

Accepted Answers:
20.870 kJ

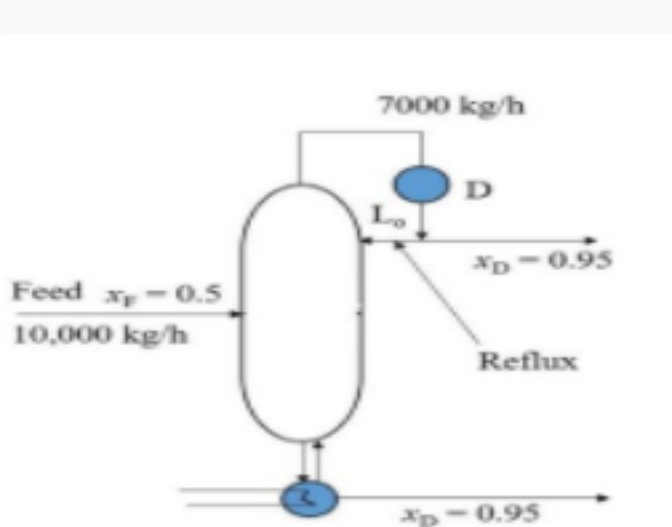
8) Which of the following is a closed system? 1 point

- car engine
 air compressor
 boiler in steam plant
 liquid cooling system in car

No, the answer is incorrect.
Score: 0

Accepted Answers:
air compressor

9) A distillation column separates 10000 kg/h of a benzene-toluene mixture, as shown in the figure. In the given figure x_F , x_D and x_W represent the weight fraction of benzene in the feed and residual respectively. Calculate the reflux ratio required for this separation. 1 point



- 0.2
 0.3
 0.4
 0.6

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.4

10) In distillation column, the reflux ratio vary between 1 point

- 0 to 1
 0
 infinite
 1 to 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
0 to 1

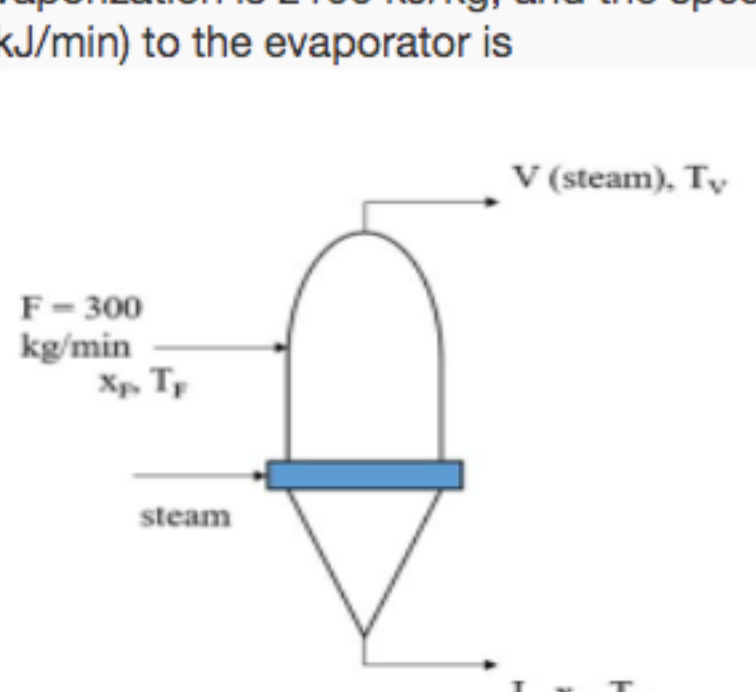
11) The rotary drier is used in 1 point

- drying milk powder
 drying detergent powder
 drying free-flowing granular material
 drying sticky material

No, the answer is incorrect.
Score: 0

Accepted Answers:
drying free-flowing granular material

12) It is desired to concentrate 20 % salt solution (20 kg of salt in 100 kg of solution) to a 30 % salt solution in an evaporator. Consider a feed of 300 kg/min at 30 °C. The boiling point of the solution is 110 °C, and the latent heat of vaporization is 2100 kJ/kg, and the specific heat of the solution is 4 kJ/kg K. The rate at which heat has to be supplied (in kJ/min) to the evaporator is 1 point



- 2.06×10^5 kJ/min
 4.06×10^5 kJ/min
 3.06×10^5 kJ/min
 5.06×10^4 kJ/min

No, the answer is incorrect.
Score: 0

Accepted Answers:
 3.06×10^5 kJ/min

13) A binary distillation column separate 100 mol/hr of a feed mixture into distillate D and residue W . Calculate the distillate and residue flow rate (mole/hr). Given: $x_F = 0.5$; $x_D = 0.98$; $x_W = 0.05$ 1 point

- 48.38 and 51.61
 23.58 and 56.28
 50.32 and 63.25
 65.45 and 75.69

No, the answer is incorrect.
Score: 0

Accepted Answers:
48.38 and 51.61

14) The detergent powder is produced by drying detergent slurry in 1 point

- freeze drier
 rotary drier
 spray drier
 drum drier

No, the answer is incorrect.
Score: 0

Accepted Answers:
spray drier

15) The commonly used refrigerant in the ice plant is 1 point

- carbon dioxide
 freon 12
 ammonia
 air

No, the answer is incorrect.
Score: 0

Accepted Answers:
ammonia